

5 We Claim:

1. A complex order processing system comprising:

a plurality of business service methods;

user interface instructions operable to:

generate a customer portal view comprising a list of products and services

10 associated with an account, a list of quotes associated with the account, a list of orders associated with the account, and a plurality of user-selectable options;

receive input from a user; and

a plurality of workflow processes, wherein at least one of the plurality of

15 workflow processes is invoked when a user selects one of the plurality of user-selectable options, and the at least one of the plurality of workflow processes invokes at least one of the plurality of business service methods to perform functions associated with the selected option.

2. The complex order processing system of claim 1, further comprising a  
20 plurality of complex objects, wherein each complex object is based on a property set of at least one of: a complex asset, a quote, and an order; and the business service methods include at least one of:

an Apply Method to create a hybrid asset/order that simulates the future

25 configuration of the complex asset by overlaying unprocessed items and attributes from open orders on one of the plurality of complex objects that is based on the complex asset;

a Delta Method to generate a delta complex object that represents the difference between at least two of the plurality of complex objects;

30 a Trim Method to create a new complex object by eliminating all items that meet predefined trim criteria from one of the plurality of complex objects;

a Logical Delete Method to generate a transformed delta order complex object by transforming items in one of the plurality of complex objects with an action code "Delete" to "Update" and changing status of the transformed items to "Inactive";

- 5 an Explode Method to copy items in one of the plurality of complex objects with quantity greater than one, and generate a delta quote complex object with a corresponding number of copies of the item with quantity equal to one;
- a Fully Exploded Method to determine whether the items in one of the plurality of complex objects have a quantity greater than one;
- 10 a Field Delta Method to set the action code of a parent quote item to "Update" when a specified field is updated;
- a Set Effectivity Dates Method to generate an "Effective End Date", an "Effective Start Date", and a "Completed Date";
- a Set Action Method to set the action code of an item in one of the plurality of complex objects;
- 15 a Save Object Method to receive a key and a property set hierarchy that represents one of the plurality of complex objects, and saves the one of the plurality of complex objects in a string to object map using the key;
- a Get Object Method to receive the key and return the one of the plurality of complex objects that corresponds to the key;
- 20 a Reset Method to delete all saved complex objects from the map;
- a Module Licensed Method to determine whether the complex order processing system is licensed for a particular computer system;
- an Update Order Status Method to check a Status field of a root item and all child items in the hierarchy of one of the plurality of complex objects based on a complex asset to determine whether the Status field is set to "Complete", "Failed" or NULL;
- 25 a Merge Method to copy all items from one of the plurality of complex objects to another of the plurality of complex objects;
- 30 a Set Field Method to enumerate through the item hierarchy of one of the plurality of complex objects, find a named field of each item, and set the named field to a specified value; and
- a Create Empty Complex Object Method to create an empty complex object based on one of the plurality of complex objects.

5           3.       The complex order processing system of claim 2, wherein the workflow  
processes include at least one of:

          a New Products and Services Process to create a quote;  
          a Modify Products and Services Process to modify a complex asset in a quote;  
          a Disconnect Products and Services Process to disconnect a complex asset;  
10          a Profile Process to retrieve account information that corresponds to a quote;  
          an Edit Quotes Line Items Process to apply all active and unprocessed orders to a  
              complex asset to generate the future state of the complex asset, and allow  
              the user to make changes to the configuration of the complex asset and  
              update a quote;  
15          a Supplemental Orders Process to create a new order by allowing the user to  
              revise a pending order;  
          an Edit Order Line Items Process to apply all active and unprocessed orders to a  
              complex asset to generate the future state of the complex asset, allow the  
              user to make changes to the configuration of the complex asset, and update  
20          an order;  
          a Quote to Order Process to convert a quote to a sales order;  
          an Update Opportunity Process to create revenue items for all quote line items;  
          a Submit Order Process to associate account information with each line item in an  
              order and set the status of the order to "open";  
25          an Ungroup Quotes Process to create multiple copies of line items in a quote that  
              have quantities greater than one;  
          an Apply Completed Sales Order Line Item To Service Profile Process to update  
              an asset table for a complex asset that has been provisioned; and  
          a Move Process to transfer a customer's complex asset configuration from an old  
30          location to a new location by entering the address of the new location and  
              entering a single option selection.

          4.       The complex order processing system of claim 3, wherein the New  
Products and Services Process is operable to:

          retrieve a selected quote;  
35          create a new quote if no quote is selected;

5 designate the billing and service accounts; and  
display the active quote.

5. The complex order processing system of claim 3, wherein the Modify Products and Services Process is operable to:

retrieve the quote that is selected;

10 create the quote if no quote is selected;

allow the user to make changes to the currently requested state of the complex asset;

apply changes specified by all open and pending orders related to the complex asset to simulate the state of the service product;

15 return an empty asset when the open and pending order disconnects a root component of the complex asset;

allow the user to change the configuration of the complex asset when the complex asset is customizable;

20 update the quote with the change between the previously requested state of the complex asset and the newly requested state of the complex asset; and  
store the updated quote.

6. The complex order processing system of claim 3, wherein the Disconnect Products and Services Process is operable to:

retrieve the quote that is selected;

25 create the quote if no quote is selected; and

allows the user to disconnect the complex asset, and create a quote line item with the complex asset disconnected.

7. The complex order processing system of claim 3, wherein the Edit Quotes Line Items Process is operable to:

30 determine whether the status of the action code of an order line item is "Add";

generate the requested future state of the complex asset by applying the prior active and unprocessed orders to the complex asset;

apply the current quote line item to the complex asset;

5           display the currently requested state of the complex asset and allow the user to  
            reconfigure the complex asset; and  
            generate the difference between the requested state of the complex asset before the  
            current order line item was applied and the state of the asset after the user  
            reconfigured the complex asset.

10           8.       The complex order processing system of claim 3, wherein the Edit Order  
Line Items Process is operable to:  
            determine whether the status of the action code of an order line item is "Add";  
            generate the requested future state of the complex asset by applying the prior  
            active and unprocessed orders to the complex asset;  
15           apply the current order line item to the complex asset;  
            display the currently requested state of the complex asset and allow the user to  
            reconfigure the complex asset; and  
            generate the difference between the requested state of the complex asset before the  
            current order line item was applied and the state of the asset after the user  
20           reconfigured the complex asset; and  
            ungroup any order line item with a quantity of more than 1 into multiple line  
            items, each with a quantity of 1.

            9.       The complex order processing system of claim 3, wherein the Quote to  
Order Process is operable to:  
25           ungroup any order line item that is tracked as an asset with a quantity of more than  
            1 into multiple line items, each with a quantity of 1  
            create a new order based on the quote;  
            set the order type of the new order to "Sales Order";  
            set the order status of the new order to "New"; and  
30           set the status of each order line item "New" if the action field is non-null.

            10.      The complex order processing system of claim 3, wherein the Update  
Opportunity Process is operable to:  
            read the quote line items for a selected quote from the database.  
            read the revenue items associated with any opportunity related to the selected  
35           quote;

5 delete existing revenue items for the selected quote;  
create revenue items for each quote line item that has at least one of the following:  
an action code of Add or Update;  
a price type that is not Usage; and  
an extended quantity that is not zero.

10 11. The complex order processing system of claim 3, wherein the Submit  
Order Process is operable to:

determine whether the order status is not Open;  
an order header with account information;.  
propagate the account information to line items in the order;  
15 set the status of the order to Open; and  
set the status of pending line items to Open.

12. The complex order processing system of claim 3, wherein the Apply  
Completed Sales Order Line Item To Service Profile Process is operable to:

update an Order Item Processed flag of the topmost order line item based on  
20 whether all line items have a status of Complete.  
trim any incomplete or failed changes from the order line items whose products  
are not tracked as assets, line items whose status is not Complete, and line  
items whose action code is "-";  
convert action codes of the order line items from Delete to Update;  
25 load the complex asset associated with the order line item from the database;  
create a new complex asset if there is no complex asset associated with the order  
line item;  
apply the order line item to the complex asset; and  
store the complex asset.

30 13. The complex order processing system of claim 3, wherein the Move  
Process is operable to:

identify a move-out address;  
identify a move-in address;  
retrieve the complex assets for the move-out address;

5 generate a move-in quote with line items from the complex assets for the move-out address;  
add account information from the complex asset for the move-out address to the move-in quote;  
generate two quote line items for each quote line item in the move-out quote,  
10 wherein one quote line item has an action code of Delete and is associated with the move-out address, and the other quote line item has an action code of Add and is associated with the move-in address.  
specify a completed date for the move-out quote;  
assign a service point to each quote line item to be connected in the move-in  
15 quote; and  
specify a connect date for the move-in quote.

14. The complex order processing system of claim 2, wherein the Apply Method is operable to:

retrieve a complex asset representing a customizable product;  
20 overlay unprocessed items and attributes of the customizable product from all of the open orders on the complex asset, wherein all of the open orders are represented in a property set in chronological order;  
generate a new property set representing the combination of the complex asset and the open orders; and  
25 set the hierarchy of the new property set to reflect the hierarchy of the open order.

15. The complex order processing system of claim 2, wherein the Delta Method is operable to:

determine when a change in the hierarchy occurs between a non-primary complex object and a primary complex object;  
30 allow the user to indicate item fields and attributes in the two complex objects to be compared;  
change the action code of an item to 'Add' when a new product is included in the non-primary complex object and not included in the primary complex object;

- 5 change the action code of an item to 'Delete' when a new product is included in the primary complex object and not included in the non-primary complex object;
- change the action code of a child item to 'Update' when no other action is indicated;
- 10 change the action code of an item to 'Update' when the non-primary complex object's item and corresponding attribute(s) are added to the primary complex object; and
- change the action code of the attribute of the item to:
- 'Update' when the attribute data has changed;
- 15 'Add' when the attribute has been added;
- 'Delete' when the attribute has been deleted; and
- '-' (blank) when the attribute data has not changed,
- when the action code of an item is changed to 'Update'.
16. The complex order processing system of claim 3, wherein the Trim
- 20 Method is operable to:
- receive a complex object, wherein the complex object represents a quotes, orders, and a service profile;
- receive a trim specification, wherein the trim specification is a delta order
- begin with the top-most item in the complex object hierarchy, and proceeds
- 25 recursively down through the root items to the trim any items and the children of the items that match criteria in the trim specification; and
- allow syntax for the trim specification to support arithmetic functions and logical operators.
17. The complex order processing system of claim 3, wherein the Explode
- 30 Method is operable to:
- change the quantity of the line item if the action code on the line item is 'Add';
- and
- recognize a list of fields that should not be copied.



5           18.     The complex order processing system of claim 3, wherein the Set Effectivity Dates Method is operable to:

generate the “Effective End Date” based on the date the action code of an item was set to “delete”;

10           generate a “Calculated Effective Start Date” which is set to the date the action code of the item was set to “add”; and

generate a “Completed Date” based on the date the order was completed.

19.     An order processing system comprising:

a complex object comprising at least one of: a service profile, quote information, and order information pertaining to an account;

15           a data manager operable to

receive at least a portion of the service profile from an external server via an information network; and

generate a business object based on the portion of the service profile; and

20           a transformation engine operable to generate at least a portion of the complex object based on the business object.

20.     The order processing system of claim 19, further comprising:  
user interface instructions operable to:

generate a customer portal view comprising a list of products and services associated with the account, a list of quotes associated with the

25           account, a list of orders associated with the account, and a plurality of user-selectable options; and

receive data input from a user.

21.     The order processing system of claim 19, further comprising:

30           a plurality of business service methods to perform functions associated with processing orders.

22.     The order processing system of claim 21, further comprising:

a plurality of workflow processes, wherein each workflow process invokes at least one of the plurality of business service methods.

- 5           23.     The order processing system of claim 20, further comprising:  
instructions operable to update the status of order line items when a provisioning  
system completes all or part of an order.  
a plurality of business service methods;  
user interface instructions operable to:
- 10                 generate a customer portal view comprising a list of products and services  
associated with an account, a list of quotes associated with the  
account, a list of orders associated with the account, and a plurality  
of user-selectable options;  
receive input from a user; and
- 15           a plurality of workflow processes, wherein at least one of the plurality of  
workflow processes is invoked when a user selects one of the plurality of  
user-selectable options, and the at least one of the plurality of workflow  
processes invokes at least one of the plurality of business service methods  
to perform functions associated with the selected option.
- 20           24.     The complex order processing system of claim 23, further comprising a  
plurality of complex objects, wherein each complex object is based on a property set of at  
least one of: a complex asset, a quote, and an order; and the business service methods  
include at least one of:
- 25                 an Apply Method to create a hybrid asset/order that simulates the future  
configuration of the complex asset by overlaying unprocessed items and  
attributes from open orders on one of the plurality of complex objects that  
is based on the complex asset;
- 30                 a Delta Method to generate a delta complex object that represents the difference  
between at least two of the plurality of complex objects;
- a Trim Method to create a new complex object by eliminating all items that meet  
predefined trim criteria from one of the plurality of complex objects;
- 35                 a Logical Delete Method to generate a transformed delta order complex object by  
transforming items in one of the plurality of complex objects with an  
action code "Delete" to "Update" and changing status of the transformed  
items to "Inactive";

- 5 an Explode Method to copy items in one of the plurality of complex objects with quantity greater than one, and generate a delta quote complex object with a corresponding number of copies of the item with quantity equal to one;
- a Fully Exploded Method to determine whether the items in one of the plurality of complex objects have a quantity greater than one;
- 10 a Field Delta Method to set the action code of a parent quote item to "Update" when a specified field is updated;
- a Set Effectivity Dates Method to generate a "Calculated Effective End Date", a "Calculated Effective Start Date", and a "Completed Date", wherein the "Calculated Effective End Date" is set to the date the action code of an
- 15 item in one of the plurality of complex objects based on an order was set to "delete", the "Calculated Effective Start Date" is set to the date the action code of the item in the one of the plurality of complex objects was set to "add", and the "Completed Date" is set to the date the order was completed;
- 20 a Set Action Method to set the action code of an item in one of the plurality of complex objects;
- a Save Object Method to receive a key and a property set hierarchy that represents one of the plurality of complex objects, and saves the one of the plurality of complex objects in a string to object map using the key;
- 25 a Get Object Method to receive the key and return the one of the plurality of complex objects that corresponds to the key;
- a Reset Method to delete all saved complex objects from the map;
- a Module Licensed Method to determine whether the complex order processing system is licensed for a particular computer system;
- 30 an Update Order Status Method to check a Status field of a root item and all child items in the hierarchy of one of the plurality of complex objects based on a complex asset to determine whether the Status field is set to "Complete", "Failed" or NULL;
- a Merge Method to copy all items from one of the plurality of complex objects to
- 35 another of the plurality of complex objects;

- 5           a Set Field Method to enumerate through the item hierarchy of one of the plurality  
            of complex objects, find a named field of each item, and set the named  
            field to a specified value; and  
            a Create Empty Complex Object Method to create an empty complex object based  
            on one of the plurality of complex objects.

10           25.    The complex order processing system of claim 21, wherein the workflow  
processes comprise:

- a Supplemental Orders Process to create a new order by allowing the user to  
            revise a pending order, wherein the Supplemental Orders Process is  
            operable to:
- 15           generate the requested future state of the complex object by applying the  
            prior active and unprocessed orders to the complex object;  
            apply a current order line item to the complex object;  
            allow the user to reconfigure the complex object;  
            generate the difference between the requested state of the complex object
- 20           before the current order line item was applied and the state of the  
            object after the user reconfigured the complex object; and  
            ungroup any order line item with a quantity of more than 1 into multiple  
            line items, each with a quantity of 1.

25           26.    The complex order processing system of claim 21, wherein the workflow  
processes comprise:

- a Move Process to transfer a customer's complex asset configuration from an old  
            location to a new location by entering the address of the new location and  
            entering a single option selection to transfer the complex asset  
            configuration from the old location to the new location.

30           27.    The complex order processing system of claim 21, further comprising a  
plurality of complex objects, wherein each complex object is based on a property set of at  
least one of: a complex asset, a quote, and an order; and the workflow processes  
comprise at least one of:

- a New Products and Services Process to create a quote;

5 a Modify Products and Services Process to modify a complex asset in a quote;  
a Disconnect Products and Services Process to disconnect a complex asset;  
a Profile Process to retrieve account information that corresponds to a quote;  
an Edit Quotes Line Items Process to apply all active and unprocessed orders to a  
complex asset to generate the future state of the complex asset, and allow  
10 the user to make changes to the configuration of the complex asset and  
update a quote;  
a Supplemental Orders Process to create a new order by allowing the user to  
revise a pending order;  
an Edit Order Line Items Process to apply all active and unprocessed orders to a  
15 complex asset to generate the future state of the complex asset, allow the  
user to make changes to the configuration of the complex asset, and update  
an order;  
a Quote to Order Process to convert a quote to a sales order;  
an Update Opportunity Process to create revenue items for all quote line items;  
20 a Submit Order Process to associate account information with each line item in an  
order and set the status of the order to “open”;  
an Ungroup Quotes Process to create multiple copies of line items in a quote that  
have quantities greater than one;  
an Apply Completed Sales Order Line Item To Service Profile Process to update  
25 an asset table for a complex asset that has been provisioned; and  
a Move Process to transfer a customer’s complex asset configuration from an old  
location to a new location by entering the address of the new location and  
entering a single option selection.

28. The complex order processing system of claim 27, wherein the Modify  
30 Products and Services Process is operable to:  
retrieve the quote that is selected;  
create the quote if no quote is selected;  
allow the user to make changes to the currently requested state of the complex  
asset;

5           apply changes specified by all open and pending orders related to the complex  
            asset to simulate the state of the service product;  
return an empty asset when the open and pending order disconnects a root  
            component of the complex asset;  
allow the user to change the configuration of the complex asset when the complex  
10           asset is customizable; and  
update the quote with the change between the previously requested state of the  
            complex asset and the newly requested state of the complex asset.

29.    The complex order processing system of claim 27, wherein the Edit  
15   Quotes Line Items Process is operable to:  
         determine whether the status of the action code of an order line item is “Add”;  
         generate the requested future state of the complex asset by applying the prior  
            active and unprocessed orders to the complex asset;  
         apply the current quote line item to the complex asset;  
20           display the currently requested state of the complex asset and allow the user to  
            reconfigure the complex asset; and  
         generate the difference between the requested state of the complex asset before the  
            current order line item was applied and the state of the asset after the user  
            reconfigured the complex asset.

25           30.    The complex order processing system of claim 27, wherein the Edit Order  
Line Items Process is operable to:  
         determine whether the status of the action code of an order line item is “Add”;  
         generate the requested future state of the complex asset by applying the prior  
            active and unprocessed orders to the complex asset;  
30           apply the current order line item to the complex asset;  
         display the currently requested state of the complex asset and allow the user to  
            reconfigure the complex asset; and  
         generate the difference between the requested state of the complex asset before the  
            current order line item was applied and the state of the asset after the user  
35           reconfigured the complex asset; and

- 5            ungroup any line items in the complex asset with a quantity of more than 1 into multiple line items, each with a quantity of 1.

31.    The complex order processing system of claim 27, wherein the Apply Completed Sales Order Line Item To Service Profile Process is operable to:

- 10            update an Order Item Processed flag of the topmost order line item based on whether all line items have a status of Complete.  
trim any incomplete or failed changes from the order line items whose products are not tracked as assets, line items whose status is not Complete, and line items whose action code is “-”;  
convert action codes of the order line items from Delete to Update;  
15            load the complex asset associated with the order line item from the database;  
create a new complex asset if there is no complex asset associated with the order line item; and  
apply the order line item to the complex asset.

32.    The complex order processing system of claim 27, wherein the Move  
20    Process is operable to:  
identify a move-out address;  
identify a move-in address;  
retrieve the complex assets for the move-out address;  
generate a move-in quote;  
25            add account information from the complex asset for the move-out address to the move-in quote;  
generate two quote line items for each quote line item in the move-out quote, wherein one quote line item has an action code of Delete and is associated with the move-out address, and the other quote line item has an action  
30            code of Add and is associated with the move-in address;  
specify a completed date for the move-out quote; and  
assign a service point to each quote line item to be connected in the move-in quote.

5           33.     The complex order processing system of claim 24, wherein the Apply  
Method is operable to:  
instructions to retrieve a complex asset representing a customizable product;  
instructions to overlay unprocessed items and attributes of the customizable  
product from all of the open orders on the complex asset, wherein all of  
10           the open orders are represented in a property set in chronological order;  
instructions to generate a new property set representing the combination of the  
complex asset and the open orders; and  
instructions to set the hierarchy of the new property set to reflect the hierarchy of  
the open order.

15           34.     The complex order processing system of claim 24, wherein the Delta  
Method is operable to:  
determine when a change in the hierarchy occurs between a non-primary complex  
object and a primary complex object;  
allow the user to indicate item fields and attributes in the two complex objects to  
20           be compared;  
change the action code of an item to 'Add' when a new product is included in the  
non-primary complex object and not included in the primary complex  
object;  
change the action code of an item to 'Delete' when a new product is included in the  
25           primary complex object and not included in the non-primary complex  
object;  
change the action code of a child item to 'Update' when no other action is  
indicated;  
change the action code of an item to 'Update' when the non-primary complex  
30           object's item and corresponding attribute(s) are added to the primary  
complex object; and  
change the action code of the attribute of the item to:  
          'Update' when the attribute data has changed;  
          'Add' when the attribute has been added;  
35           'Delete' when the attribute has been deleted; and



5                   ‘-‘ (blank) when the attribute data has not changed,  
when the action code of an item is changed to ‘Update’.

35.     The complex order processing system of claim 24, wherein the Trim  
Method is operable to:

10                   receive a complex object, wherein the complex object represents a quotes, orders,  
and a service profile;  
receive a trim specification, wherein the trim specification is a delta order  
begin with the top-most item in the complex object hierarchy, and proceeds  
recursively down through the root items to the trim any items and the  
children of the items that match criteria in the trim specification; and  
15                   allow syntax for the trim specification to support arithmetic functions and logical  
operators.

36.     An apparatus for processing orders comprising:  
a plurality of business service methods;  
means for generating a customer portal comprising a list of products and services  
20                   associated with an account, a list of quotes associated with the account, a  
list of orders associated with the account, and a plurality of user-selectable  
options, wherein the customer portal is accessible by users including  
customer service representatives, customers, and service providers for the  
customers;  
25                   means for receiving input from a user; and  
means for invoking a workflow process, and the workflow process invokes at least  
one of the plurality of business service methods to perform functions  
associated with the selected option;  
means for receiving at least one of: a service profile, quote information, and order  
30                   information pertaining to an account from an external server;  
means for generating a business object based on the at least one of: a service  
profile, quote information, and order information; and  
means for transforming at least a portion of the business object to a complex  
object.

5           37.     The apparatus of claim 36, further comprising:  
instructions operable to update the status of order line items when a provisioning  
system completes all or part of an order.

          38.     The apparatus of claim 36, wherein the plurality of business service  
methods include at least one of:

10           an Apply Method to create a hybrid asset/order that simulates the future  
configuration of the complex asset by overlaying unprocessed items and  
attributes from open orders on one of the plurality of complex objects that  
is based on the complex asset;  
          a Delta Method to generate a delta complex object that represents the difference  
15           between at least two of the plurality of complex objects;  
          a Trim Method to create a new complex object by eliminating all items that meet  
predefined trim criteria from one of the plurality of complex objects;  
          a Logical Delete Method to generate a transformed delta order complex object by  
transforming items in one of the plurality of complex objects with an  
20           action code “Delete” to “Update” and changing status of the transformed  
items to “Inactive”;  
          an Explode Method to copy items in one of the plurality of complex objects with  
quantity greater than one, and generate a delta quote complex object with a  
corresponding number of copies of the item with quantity equal to one;  
25           a Fully Exploded Method to determine whether the items in one of the plurality of  
complex objects have a quantity greater than one;  
          a Field Delta Method to set the action code of a parent quote item to “Update”  
when a specified field is updated;  
          a Set Effectivity Dates Method to generate a “Calculated Effective End Date”, a  
30           “Calculated Effective Start Date”, and a “Completed Date”, wherein the  
“Calculated Effective End Date” is set to the date the action code of an  
item in one of the plurality of complex objects based on an order was set to  
“delete”, the “Calculated Effective Start Date” is set to the date the action  
code of the item in the one of the plurality of complex objects was set to

5                   “add”, and the “Completed Date” is set to the date the order was  
completed;  
a Set Action Method to set the action code of an item in one of the plurality of  
complex objects;  
a Save Object Method to receive a key and a property set hierarchy that represents  
10                   one of the plurality of complex objects, and saves the one of the plurality  
of complex objects in a string to object map using the key;  
a Get Object Method to receive the key and return the one of the plurality of  
complex objects that corresponds to the key;  
a Reset Method to delete all saved complex objects from the map;  
15                   a Module Licensed Method to determine whether the complex order processing  
system is licensed for a particular computer system;  
an Update Order Status Method to check a Status field of a root item and all child  
items in the hierarchy of one of the plurality of complex objects based on a  
complex asset to determine whether the Status field is set to “Complete”,  
20                   “Failed” or NULL;  
a Merge Method to copy all items from one of the plurality of complex objects to  
another of the plurality of complex objects;  
a Set Field Method to enumerate through the item hierarchy of one of the plurality  
of complex objects, find a named field of each item, and set the named  
25                   field to a specified value; and  
a Create Empty Complex Object Method to create an empty complex object based  
on one of the plurality of complex objects.

39.     The apparatus of claim 36, wherein the workflow process comprises:  
a Supplemental Orders Process to create a new order by allowing the user to  
30                   revise a pending order, wherein the Supplemental Orders Process  
comprises:  
means to generate the requested future state of the complex object by applying the  
prior active and unprocessed orders to the complex object;  
means to apply a current order line item to the complex object;  
35                   means to allow the user to reconfigure the complex object; and

5 means to generate the difference between the requested state of the complex  
object before the current order line item was applied and the state of the  
object after the user reconfigured the complex object; and  
means to ungroup any order line item with a quantity of more than 1 into multiple  
line items, each with a quantity of 1..

10 40. The apparatus of claim 36, wherein the workflow process comprises:  
a Move Process to transfer a customer's complex asset configuration from an old  
location to a new location by entering the address of the new location and  
entering a single option selection to transfer the complex asset  
configuration from the old location to the new location.

15 41. The apparatus of claim 36, wherein the workflow process comprises at  
least one of:  
a New Products and Services Process to create a quote;  
a Modify Products and Services Process to modify a complex asset in a quote;  
a Disconnect Products and Services Process to disconnect a complex asset;  
20 a Profile Process to retrieve account information that corresponds to a quote;  
an Edit Quotes Line Items Process to apply all active and unprocessed orders to a  
complex asset to generate the future state of the complex asset, and allow  
the user to make changes to the configuration of the complex asset and  
update a quote;  
25 a Supplemental Orders Process to create a new order by allowing the user to  
revise a pending order;  
an Edit Order Line Items Process to apply all active and unprocessed orders to a  
complex asset to generate the future state of the complex asset, allow the  
user to make changes to the configuration of the complex asset, and update  
30 an order;  
a Quote to Order Process to convert a quote to a sales order;  
an Update Opportunity Process to create revenue items for all quote line items;  
a Submit Order Process to associate account information with each line item in an  
order and set the status of the order to "open";

5 an Ungroup Quotes Process to create multiple copies of line items in a quote that  
have quantities greater than one;  
an Apply Completed Sales Order Line Item To Service Profile Process to update  
an asset table for a complex asset that has been provisioned; and  
a Move Process to transfer a customer's complex asset configuration from an old  
10 location to a new location by entering the address of the new location and  
entering a single option selection.

42. The apparatus of claim 41, wherein the Modify Products and Services  
Process comprises:

15 means for retrieving the quote that is selected;  
means for creating the quote if no quote is selected;  
means for allowing the user to make changes to the currently requested state of the  
complex asset;  
means for applying changes specified by all open and pending orders related to  
the complex asset to simulate the state of the service product;  
20 means for returning an empty asset when the open and pending order disconnects  
a root component of the complex asset;  
means for allowing the user to change the configuration of the complex asset  
when the complex asset is customizable;  
means for updating the quote with the change between the previously requested  
25 state of the complex asset and the newly requested state of the complex  
asset; and  
means for storing the updated quote.

30 43. The apparatus of claim 41, wherein the Edit Quotes Line Items Process  
comprises:

means for determining whether the status of the action code of an order line item  
is "Add";  
means for generating the requested future state of the complex asset by applying  
the prior active and unprocessed orders to the complex asset;  
35 means for applying the current quote line item to the complex asset;

- 5 means for allowing the user to reconfigure the complex asset; and  
means for generating the difference between the requested state of the complex  
asset before the current order line item was applied and the state of the  
asset after the user reconfigured the complex asset.
- 10 44. The apparatus of claim 41, wherein the Edit Order Line Items Process  
comprises:  
means for determining whether the status of the action code of an order line item  
is "Add";  
means for generating the requested future state of the complex asset by applying  
the prior active and unprocessed orders to the complex asset;  
15 means for applying the current order line item to the complex asset;  
means for displaying the currently requested state of the complex asset and allow  
the user to reconfigure the complex asset; and  
means for generating the difference between the requested state of the complex  
asset before the current order line item was applied and the state of the  
20 asset after the user reconfigured the complex asset; and  
means for ungrouping any order line item with a quantity of more than 1 into  
multiple line items, each with a quantity of 1.
45. The apparatus of claim 41, wherein the Apply Completed Sales Order Line  
Item To Service Profile Process comprises:  
25 means for updating an Order Item Processed flag of the topmost order line item  
based on whether all line items have a status of Complete.  
means for trimming any incomplete or failed changes from the order line items  
whose products are not tracked as assets, line items whose status is not  
Complete, and line items whose action code is "-";  
30 means for converting action codes of the order line items from Delete to Update;  
means for loading the complex asset associated with the order line item from the  
database;  
means for creating a new complex asset if there is no complex asset associated  
with the order line item;  
35 means for applying the order line item to the complex asset; and

5 means for storing the complex asset.

46. The apparatus of claim 41, wherein the Move Process comprises:

means for identifying a move-out address;

means for identifying a move-in address;

means for retrieving the complex assets for the move-out address;

10 means for generating a move-in quote with line items from the complex assets for the move-out address;

means for adding account information from the complex asset for the move-out address to the move-in quote;

15 means for generating two quote line items for each quote line item in the move-out quote, wherein one quote line item has an action code of Delete and is associated with the move-out address, and the other quote line item has an action code of Add and is associated with the move-in address.

means for specifying a completed date for the move-out quote;

20 means for assigning a service point to each quote line item to be connected in the move-in quote; and

means for specifying a connect date for the move-in quote.

47. The apparatus of claim 38, wherein the Apply Method comprises:

means for retrieving a complex asset representing a customizable product;

means for overlaying unprocessed items and attributes of the customizable

25 product from all of the open orders on the complex asset, wherein all of the open orders are represented in a property set in chronological order;

means for generating a new property set representing the combination of the complex asset and the open orders; and

30 means for setting the hierarchy of the new property set to reflect the hierarchy of the open order.

48. The apparatus of claim 38, wherein the Delta Method comprises:

means for determining when a change in the hierarchy occurs between a non-primary complex object and a primary complex object;

- 5 means for allowing the user to indicate item fields and attributes in the two complex objects to be compared;
- means for changing the action code of an item to 'Add' when a new product is included in the non-primary complex object and not included in the primary complex object;
- 10 means for changing the action code of an item to 'Delete' when a new product is included in the primary complex object and not included in the non-primary complex object;
- means for changing the action code of a child item to 'Update' when no other action is indicated;
- 15 means for changing the action code of an item to 'Update' when the non-primary complex object's item and corresponding attribute(s) are added to the primary complex object; and
- means for changing the action code of the attribute of the item to:
- 'Update' when the attribute data has changed;
- 20 'Add' when the attribute has been added;
- 'Delete' when the attribute has been deleted; and
- '-' (blank) when the attribute data has not changed,
- when the action code of an item is changed to 'Update'.

49. The apparatus of claim 38, wherein the Trim Method comprises:

- 25 means for receiving a complex object, wherein the complex object represents a quotes, orders, and a service profile;
- means for receiving a trim specification, wherein the trim specification is a delta order
- means for beginning with the top-most item in the complex object hierarchy, and
- 30 proceeds recursively down through the root items to the trim any items and the children of the items that match criteria in the trim specification; and
- means for allowing syntax for the trim specification to support arithmetic functions and logical operators.

50. A method for processing orders comprising:



5 generating a customer portal comprising a list of products and services associated  
with an account, a list of quotes associated with the account, a list of  
orders associated with the account, and a plurality of user-selectable  
options, wherein the customer portal is accessible by users including  
customer service representatives, customers, and service providers for the  
10 customers;

invoking a workflow process, and the workflow process invokes at least one  
business service method to perform functions associated with the selected  
option;

receiving at least one of: a service profile, quote information, and order  
15 information pertaining to an account;

generating a business object based on the at least one of: a service profile, quote  
information, and order information; and

transforming at least a portion of the business object to a complex object.

51. The method of claim 50, further comprising:

20 instructions operable to update the status of order line items when a provisioning  
system completes all or part of an order.

52. The method of claim 50, wherein the plurality of business service methods  
include at least one of:

an Apply Method to create a hybrid asset/order that simulates the future  
25 configuration of the complex object by overlaying unprocessed items and  
attributes from open orders on one of the plurality of complex objects that  
is based on the complex object;

a Delta Method to generate a delta complex object that represents the difference  
between at least two of the plurality of complex objects;

30 a Trim Method to create a new complex object by eliminating all items that meet  
predefined trim criteria from one of the plurality of complex objects;

a Logical Delete Method to generate a transformed delta order complex object by  
transforming items in one of the plurality of complex objects with an  
action code "Delete" to "Update" and changing status of the transformed  
35 items to "Inactive";

- 5 an Explode Method to copy items in one of the plurality of complex objects with quantity greater than one, and generate a delta quote complex object with a corresponding number of copies of the item with quantity equal to one;
- a Fully Exploded Method to determine whether the items in one of the plurality of complex objects have a quantity greater than one;
- 10 a Field Delta Method to set the action code of a parent quote item to “Update” when a specified field is updated;
- a Set Effectivity Dates Method to generate a “Calculated Effective End Date”, a “Calculated Effective Start Date”, and a “Completed Date”, wherein the “Calculated Effective End Date” is set to the date the action code of an
- 15 item in one of the plurality of complex objects based on an order was set to “delete”, the “Calculated Effective Start Date” is set to the date the action code of the item in the one of the plurality of complex objects was set to “add”, and the “Completed Date” is set to the date the order was completed;
- 20 a Set Action Method to set the action code of an item in one of the plurality of complex objects;
- a Save Object Method to receive a key and a property set hierarchy that represents one of the plurality of complex objects, and saves the one of the plurality of complex objects in a string to object map using the key;
- 25 a Get Object Method to receive the key and return the one of the plurality of complex objects that corresponds to the key;
- a Reset Method to delete all saved complex objects from the map;
- a Module Licensed Method to determine whether the complex order processing system is licensed for a particular computer system;
- 30 an Update Order Status Method to check a Status field of a root item and all child items in the hierarchy of one of the plurality of complex objects based on a complex object to determine whether the Status field is set to “Complete”, “Failed” or NULL;
- a Merge Method to copy all items from one of the plurality of complex objects to
- 35 another of the plurality of complex objects;

- 5           a Set Field Method to enumerate through the item hierarchy of one of the plurality  
            of complex objects, find a named field of each item, and set the named  
            field to a specified value; and  
            a Create Empty Complex Object Method to create an empty complex object based  
            on one of the plurality of complex objects.

- 10          53.     The method of claim 50, wherein the workflow process comprises:  
            a Supplemental Orders Process to create a new order by allowing the user to  
            revise a pending order, wherein the Supplemental Orders Process  
            comprises:  
            means to generate the requested future state of the complex object by applying the  
15              prior active and unprocessed orders to the complex object;  
            means to apply a current order line item to the complex object;  
            means to allow the user to reconfigure the complex object; and  
            means to generate the difference between the requested state of the complex  
            object before the current order line item was applied and the state of the  
20              object after the user reconfigured the complex object; and  
            means to ungroup any order line item with a quantity of more than 1 into multiple  
            line items, each with a quantity of 1..

54.     The method of claim 36, wherein the workflow process comprises:  
            a Move Process to transfer a customer's asset configuration from an old location  
25              to a new location by entering the address of the new location and entering  
            a single option selection to transfer the asset configuration from the old  
            location to the new location.

55.     The method of claim 50, wherein the workflow process comprises at least  
            one of:  
30              a New Products and Services Process to create a quote;  
            a Modify Products and Services Process to modify a complex asset in a quote;  
            a Disconnect Products and Services Process to disconnect a complex asset;  
            a Profile Process to retrieve account information that corresponds to a quote;

- 5 an Edit Quotes Line Items Process to apply all active and unprocessed orders to a complex asset to generate the future state of the complex asset, and allow the user to make changes to the configuration of the complex asset and update a quote;
- 10 a Supplemental Orders Process to create a new order by allowing the user to revise a pending order;
- an Edit Order Line Items Process to apply all active and unprocessed orders to a complex asset to generate the future state of the complex asset, allow the user to make changes to the configuration of the complex asset, and update an order;
- 15 a Quote to Order Process to convert a quote to a sales order;
- an Update Opportunity Process to create revenue items for all quote line items;
- a Submit Order Process to associate account information with each line item in an order and set the status of the order to “open”;
- 20 an Ungroup Quotes Process to create multiple copies of line items in a quote that have quantities greater than one;
- an Apply Completed Sales Order Line Item To Service Profile Process to update an asset table for a complex asset that has been provisioned; and
- a Move Process to transfer a customer’s complex asset configuration from an old location to a new location by entering the address of the new location and entering a single option selection.
- 25

56. The method of claim 55, wherein the Modify Products and Services Process comprises:

- retrieving the quote that is selected;
- creating the quote if no quote is selected;
- 30 allowing the user to make changes to the currently requested state of the complex object;
- applying changes specified by all open and pending orders related to the complex object to simulate the state of the service product;
- returning an empty asset when the open and pending order disconnects a root
- 35 component of the complex object;

5           allowing the user to change the configuration of the complex object when the  
            complex object is customizable; and  
            updating the quote with the change between the previously requested state of the  
            complex object and the newly requested state of the complex object.

10           57.     The method of claim 55, wherein the Edit Quotes Line Items Process  
            comprises:  
            determining whether the status of the action code of an order line item is “Add”;  
            generating the requested future state of the complex object by applying the prior  
            active and unprocessed orders to the complex object;  
15           applying the current quote line item to the complex object;  
            allowing the user to reconfigure the complex object; and  
            generating the difference between the requested state of the complex object before  
            the current order line item was applied and the state of the asset after the  
            user reconfigured the complex object.

20           58.     The method of claim 55, wherein the Edit Order Line Items Process  
            comprises:  
            determining whether the status of the action code of an order line item is “Add”;  
            generating the requested future state of the complex object by applying the prior  
            active and unprocessed orders to the complex object;  
25           applying the current order line item to the complex object;  
            displaying the currently requested state of the complex object and allow the user  
            to reconfigure the complex object; and  
            generating the difference between the requested state of the complex object before  
            the current order line item was applied and the state of the asset after the  
30           user reconfigured the complex object; and  
            ungrouping any order line item with a quantity of more than 1 into multiple line  
            items, each with a quantity of 1.

            59.     The method of claim 55, wherein the Apply Completed Sales Order Line  
Item To Service Profile Process comprises:

5 updating an Order Item Processed flag of the topmost order line item based on  
whether all line items have a status of Complete.  
trimming any incomplete or failed changes from the order line items whose  
products are not tracked as assets, line items whose status is not Complete,  
and line items whose action code is "-";  
10 converting action codes of the order line items from Delete to Update;  
loading the complex object associated with the order line item from the database;  
creating a new complex object if there is no complex object associated with the  
order line item;  
applying the order line item to the complex object; and  
15 storing the complex object.

60. The method of claim 55, wherein the Move Process comprises:  
identifying a move-out address;  
identifying a move-in address;  
retrieving the complex objects for the move-out address;  
20 generating a move-in quote with line items from the complex objects for the  
move-out address;  
adding account information from the complex object for the move-out address to  
the move-in quote;  
generating two quote line items for each quote line item in the move-out quote,  
25 wherein one quote line item has an action code of Delete and is associated  
with the move-out address, and the other quote line item has an action  
code of Add and is associated with the move-in address.  
specifying a completed date for the move-out quote;  
assigning a service point to each quote line item to be connected in the move-in  
30 quote; and  
specifying a connect date for the move-in quote.

61. The method of claim 52, wherein the Apply Method comprises:  
retrieving a complex object representing a customizable product;

5           overlaying unprocessed items and attributes of the customizable product from all  
            of the open orders on the complex object, wherein all of the open orders  
            are represented in a property set in chronological order;  
            generating a new property set representing the combination of the complex object  
            and the open orders; and  
10          setting the hierarchy of the new property set to reflect the hierarchy of the open  
            order.

62.       The method of claim 52, wherein the Delta Method comprises:  
            determining when a change in the hierarchy occurs between a non-primary  
            complex object and a primary complex object;  
15          allowing the user to indicate item fields and attributes in the two complex objects  
            to be compared;  
            changing the action code of an item to 'Add' when a new product is included in  
            the non-primary complex object and not included in the primary complex  
            object;  
20          changing the action code of an item to 'Delete' when a new product is included in  
            the primary complex object and not included in the non-primary complex  
            object;  
            changing the action code of a child item to 'Update' when no other action is  
            indicated;  
25          changing the action code of an item to 'Update' when the non-primary complex  
            object's item and corresponding attribute(s) are added to the primary  
            complex object; and  
            changing the action code of the attribute of the item to:  
                'Update' when the attribute data has changed;  
30              'Add' when the attribute has been added;  
                'Delete' when the attribute has been deleted; and  
                '-' (blank) when the attribute data has not changed,  
            when the action code of an item is changed to 'Update'.

63.       The method of claim 52, wherein the Trim Method comprises:

5 receiving a complex object, wherein the complex object represents a quotes,  
orders, and a service profile;  
receiving a trim specification, wherein the trim specification is a delta order  
beginning with the top-most item in the complex object hierarchy, and proceeds  
recursively down through the root items to the trim any items and the  
10 children of the items that match criteria in the trim specification; and  
allowing syntax for the trim specification to support arithmetic functions and  
logical operators.

64. A computer program product comprising: instructions to implement the  
method of claim 50.

15 65. A data signal in a carrier medium comprising: instructions to implement  
the method of claim 50.

66. A method of processing orders comprising:  
detecting selection of an option to transfer a customer's complex asset  
configuration from an old location to a new location;  
20 copying the complex asset configuration into a quote with a status indicator to add  
the complex asset configuration to the new location; and  
copying the complex asset configuration into another quote with a status indicator  
to disconnect the complex asset configuration at the old location.